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LABOR-SAVING METHODS FOR MAKING CHEDDAR CHEESE [1]

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Labor-saving procedures and equipment for making Cheddar cheese are urgently needed to compensate for increased labor costs. Also, means for improving the flavor and uniformity of cheese are needed to increase consumption.

Conventional methods for making Cheddar cheese require much hand labor, particularly during the cheddaring or matting process. Several commercial cheese companies, equipment makers, and state agricultural experiment stations have attempted to develop a stirred-curd method that would require appreciably less hand-labor and consequently reduce manufacturing costs. Some workers achieved a fair degree of success but, in general, the resultant product had a more open texture than that characteristic of Cheddar cheese. Satisfactory results were not obtained when these proposed methods were tested in our laboratory; the texture of the cheese was too open.

Earlier, promising results were obtained by the Department when salted curd was hooped in salted whey. This finding resulted in the development of a short-time method, which was reported in 1953. However, there were recognized objections to certain parts of that method. It required special types of cheesemaking equipment. Also, approximately one-half of the whey was unusable because it contained 4% added salt.

Australian investigators carried out extensive studies with our method and concluded that it was not commercially acceptable, particularly because of the hooping in salted whey. However, using some of the basic principles of our method, they developed a method that was accepted by several of their commercial factories, and cheese was made for export.

Continued research in our laboratory resulted in several important changes in the original procedure. The amount of salted whey for hooping the curd was reduced significantly, and most of the special equipment was eliminated. "A Simplified Short-Time Method for Making Cheddar Cheese from Pasteurized Milk" was reported in 1955 (ARS-73-11). The method will be briefly described:

The starter employed is a mixture of a conventional lactic starter and the heat- and salt-tolerant *Streptococcus durans,* which are propagated separately. The starter and rennet are added to pasteurized milk at 88° F. The curd is cut and cooked to 100° F. in a conventional cheese vat. The whey is drained off and the curd is salted. The salted curd is hooped at about 110° F. in a small volume of either salted whey or salted water, drained under pressure for a few minutes, and pressed overnight in a conventional cheese press. The method requires only 3 hr. until the curd is pressed, instead of the conventional 5½ to 6½ hr.

The quality of the cheese made by this method is excellent. It has a clean, mild flavor and an extremely close texture. However, some persons have objected to this close texture and the lack of mechanical openings. Also, some have objected to a need for additional hooping equipment.

In view of these objections, it seemed desirable to investigate possible changes that might be made in the simplified method. It was decided to approach the problem on the basis that: *(1)* A saving of labor is more important than a saving of time; *(2)* some mechanical openings in Cheddar cheese are not undesirable, and *(3)* a labor-saving method should deviate as little as possible from conventional methods.

A rather simple change has been made in the conventional method which seems to offer a practical means for saving much hand-labor. The new method has been tested repeatedly on a pilot-plant scale. It has not been tested on a commercial scale; therefore, its final evaluation must await results obtained in commercial cheese factories.

With the new method, the conventional 7-hr. method of making Cheddar cheese from pasteurized milk, as described in USDA Circular No. 880, is followed, except during the period from draining the whey to milling the curd. At the usual time for draining off the whey, the mixture of curd and whey is pumped with a positive-action rotary pump into a cheesecloth-lined, perforated curd-retention and matting device which has been placed in a tank. (See description which follows.) The mixture of curd and whey is discharged at the top of the device. The curd falls to the bottom, forming a layer under the whey, and most of the free air entrapped between the curd particles is released and comes to the surface of the whey. When pumping has been completed, the cheesecloth is folded over the curd, a perforated top plate is placed on the covered curd, weights equal to 30 lb. per square foot are added, and the whey is drained from the tank. The whey

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continues to drain from the curd and the curd mats for 2 hr. without being turned. Then the weights, top plate, and cheesecloth are removed and the large block of curd is cut into ¾-in. slabs for milling. Conventional procedures are followed in milling, salting, hooping, dressing, and pressing the curd. Most of the tedious hand-labor required during the 2¼-hr. matting period is eliminated. Further, the cheese vat is available for reuse when pumping is completed.

Cheese made with this method has had the same general characteristics and composition as cheese made with the conventional method. It has had a typical Cheddar cheese flavor, few mechanical openings, and a firm, pliable body. During the early months of curing, more flavor developed and the body became smoother and more waxy. Time has not permitted a determination of the amount of flavor development upon extending aging.

The stainless steel curd-retention and matting device used in developing this method was 22 in. wide, 49 in. long, and 24 in. deep. It was perforated with ¼-in. circular holes every 2½ in. on centers throughout the lower 12 in. The upper half was not perforated. The top and bottom plates were perforated. The device was large enough to hold the curd from 4,000 lb. of milk. The tank was slightly larger than the matting device and it was deep enough to insure complete coverage of the curd with whey throughout the pumping period. It was so constructed that the excess whey could be drained off near the top.

Numerous variations from the conventional procedure have been tried, but so far this modification has yielded the best results. Research is continuing, to determine more precisely the effects of variations in individual steps of the new procedure.